

PATENT
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :
KAMVYSELIS, Peter :
:
Application No.: To be assigned : Art Unit: To be assigned
:
Filed: September 28, 2001 : Examiner: To be assigned
:
For: ORDERED WRITES FOR : Docket No.: EMS-02002
SRDF ASSIST :
:

Certificate of Express Mailing

I hereby certify that the foregoing documents are being deposited with the United States Postal Service as express mail, in an envelope addressed to the Commissioner for Patents Washington, D.C. 20231 on this date of September 28, 2001.


Name: Tracey Newell
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PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, entry of this amendment is respectfully requested for the above-captioned U.S. patent application.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those which may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required for consideration of this paper (including fees for net addition of claims) are authorized to be charged in two originally-executed copies of a Transmittal Letter filed herewith.

IN THE TITLE:

Please replace the title with:

--ORDERED WRITES FOR SRDF ASSIST--

IN THE SPECIFICATION:

On page 1, after the title, please add:

-- Cross-Reference to Related Applications

This application is a continuation of U.S. patent application No. 09/940,903 filed on August 28, 2001 (pending).--

IN THE CLAIMS:

Please cancel Claims 1-62 without prejudice or disclaimer of the subject matter thereof.

Please add the following new Claims 63-108:

63. A method of sending data, comprising:

obtaining a first predetermined value for a sequence number;

obtaining blocks of data, wherein each of the blocks of data corresponds to a packet of data;

assigning the first predetermined value as the sequence number to each of the packets of data; and

in response to the sequence number becoming equal to a second predetermined value different from the first predetermined value, acknowledging receipt of the blocks of data corresponding to the packets of data that are assigned the first predetermined value as the sequence number and sending the packets of data that are assigned the first predetermined value as the sequence number to a destination.

64. The method of Claim 63, the method further comprising:

prior to acknowledging, indicating to a first storage device a transfer ready signal; and

sending said blocks of data to a second storage device.

65. The method of Claim 64, wherein said acknowledging is performed prior to providing said blocks of data to said second storage device.

66. The method of Claim 63, wherein the second predetermined value is a number that is one greater than the first predetermined value.

67. The method of Claim 63, further comprising:

in response to the sequence number becoming equal to the second predetermined value, providing a value to each of the packets corresponding to a total number of packets of data that are assigned the first predetermined value as the sequence number.

68. The method of Claim 63, further comprising:

incrementing the sequence number periodically.

69. The method of Claim 68, wherein incrementing the sequence number periodically includes incrementing the sequence number according to an amount of time between a first block of data being provided and a second block of data being provided, wherein the second block of data being provided depends upon the first block of data being provided.

70. The method of Claim 63, further comprising:

prior to sending the packets of data, storing the data in a journal.

71. A method of receiving data, comprising:

 accumulating received packets of data having a sequence number equal to a first predetermined value;

 obtaining a first indication that the sequence number equals the first predetermined value;

 obtaining a second indication that the sequence number equals a second predetermined value different from the first predetermined value; and

 in response to obtaining the second indication, transferring data corresponding to packets of data having the sequence number equal to the first predetermined value to a receiving device.

72. The method of Claim 71, further comprising:

 following obtaining the first indication, initiating a transfer command to the receiving device.

73. The method of Claim 72, wherein data is not transferred to the receiving device until the receiving device acknowledges initiation of data transfer in response to the transfer command being initiated.

74. The method of Claim 73, further comprising:

 acknowledging completion of sending said data to said receiving device prior to all said data actually being transferred to said receiving device.

75. The method of Claim 74, wherein acknowledging is performed in response to a sending storage device receiving the transfer command.

76. The method of Claim 71, wherein the second predetermined value is a number that is one greater than the first predetermined value.

77. The method of Claim 71, further comprising:

incrementing the sequence number periodically.

78. The method of Claim 77, wherein incrementing the sequence number periodically includes incrementing the sequence number according to an amount of time between a first packet of data being provided and a second packet of data being provided, wherein the second packet of data being provided depends upon the first packet of data being provided.

79. The method of Claim 71, further comprising:

prior to transferring the data, storing the data in a journal.

80. A method of transferring data, comprising:

obtaining a first predetermined value for a first sequence number;

obtaining blocks of data, wherein each of the blocks of data corresponds to a packet of data;

assigning the first predetermined value as the first sequence number to each of the packets of data;

in response to the first sequence number becoming equal to a second predetermined value different from the first predetermined value, acknowledging receipt of the blocks of data corresponding to the packets of data that are assigned the first predetermined value as the sequence number and sending the packets of data that are assigned the first predetermined value as the sequence number to a destination;

accumulating received packets of data having a sequence number equal to said first predetermined value;

obtaining a first indication that the sequence number equals the first predetermined value;

obtaining a second indication that the sequence number equals a second predetermined value different from the first predetermined value; and

in response to obtaining the second indication, transferring data corresponding to packets of data having the sequence number equal to the first predetermined value to a receiving device.

81. A computer system comprising:

a host performing a data operation for transferring blocks of data from a first device to a second device;

a first WAN blade connected to said first device;

a second WAN blade connected to said first WAN blade by a network, said second device being connected to said second WAN blade;

wherein said first WAN blade includes machine executable code that receives said blocks of data from said first storage device, each of said blocks corresponding to a packet of data, assigns a first predetermined value to each of said packets of data, and, in response to receiving a second predetermined value different than said first predetermined value, acknowledges receipt of said blocks of data associated with said first predetermined value and sending the packets of data that are assigned the first predetermined value as a sequence number to said second device; and

said second WAN blade includes machine executable code that receives said packets of data associated with said first predetermined value, obtains an indication of said first predetermined value as a sequence number, obtains a second indication that the sequence number equals a second predetermined value different from the first predetermined value, and in response to obtaining the second indication, transfers data corresponding to packets of data having the sequence number equal to the first predetermined value to said second device.

82. The computer system of Claim 81, wherein said first WAN blade is one of a first set of WAN blades, said second WAN blade is one of second set of WAN blades, said first device is included in a first consistency group of a plurality of storage devices, and said second device is included in a second consistency group of a plurality of storage devices.

83. The computer system of Claim 82, wherein said first device is a primary storage device of the first consistency group, and said host computer is a first host computer coupled to said first device.

84. The computer system of Claim 83, wherein said second device is a primary storage device of said second consistency group, and the computer system further includes a second host computer coupled to said second device.

85. The computer system of Claim 84, wherein other devices included in said first and second consistency groups are secondary storage devices.

86. A computer program product for sending data, comprising:

 machine executable code that obtains a first predetermined value for a sequence number;

 machine executable code that obtains blocks of data, wherein each of the blocks of data corresponds to a packet of data;

 machine executable code that assigns the first predetermined value as the sequence number to each of the packets of data; and

 machine executable code that, in response to the sequence number becoming equal to a second predetermined value different from the first predetermined value, acknowledges receipt of the blocks of data corresponding to the packets of data that are assigned the first predetermined value as the sequence number and sending the packets of data that are assigned the first predetermined value as the sequence number to a destination.

87. The computer program product of Claim 86, further comprising:

 machine executable code that, prior to said acknowledging, indicates to a first storage device a transfer ready signal; and

 machine executable code that sends said blocks of data to a second storage device.

88. The computer program product of Claim 87, wherein said machine executable code that acknowledges is executed prior to providing said blocks of data to said second storage device.

89. The computer program product of Claim 86, wherein the second predetermined value is a number that is one greater than the first predetermined value.

90. The computer program product of Claim 86, further comprising:

machine executable code that, in response to the sequence number becoming equal to the second predetermined value, provides a value to each of the packets corresponding to a total number of packets of data that are assigned the first predetermined value as the sequence number.

91. The computer program product of Claim 86, further comprising:

machine executable code that increments the sequence number periodically.

92. The machine executable code of Claim 91, wherein said machine executable code that increments the sequence number periodically includes machine executable code that increments the sequence number according to an amount of time between a first block of data being provided and a second block of data being provided, wherein the second block of data being provided depends upon the first block of data being provided.

93. The computer program product of Claim 86, further comprising:

machine executable code that, prior to sending the packets of data, stores the data in a journal.

94. A computer program product for receiving data, comprising:

 machine executable code that accumulates received packets of data having a sequence number equal to a first predetermined value;

 machine executable code that obtains a first indication that the sequence number equals the first predetermined value;

 machine executable code that obtains a second indication that the sequence number equals a second predetermined value different from the first predetermined value;
and

 machine executable code that, in response to obtaining the second indication, transfers data corresponding to packets of data having the sequence number equal to the first predetermined value to a receiving device.

95. The computer program product of Claim 94, further comprising:

 machine executable code that, following obtaining the first indication, initiates a transfer command to the receiving device.

96. The computer program product of Claim 95, wherein data is not transferred to the receiving device until the receiving device acknowledges initiation of data transfer in response to the transfer command being initiated.

97. The computer program product of Claim 96, further comprising:

machine executable code that acknowledges completion of sending said data to said receiving device prior to all said data actually being transferred to said receiving device.

98. The computer program product of Claim 97, wherein said machine executable code that acknowledges is executed in response to a sending storage device receiving the transfer command.

99. The computer program product of Claim 94, wherein the second predetermined value is a number that is one greater than the first predetermined value.

100. The computer program product of Claim 94, further comprising:

machine executable code that increments the sequence number periodically.

101. The computer program product of Claim 100, wherein said machine executable code that increments the sequence number periodically includes machine executable code that increments the sequence number according to an amount of time between a first packet of data being provided and a second packet of data being provided, wherein the second packet of data being provided depends upon the first packet of data being provided.

102. The computer program product of Claim 94, further comprising:

machine executable code that, prior to transferring the data, stores the data in a journal.

103. A computer program product for transferring data, comprising:

 machine executable code that obtains a first predetermined value for a first sequence number;

 machine executable code that obtains blocks of data, wherein each of the blocks of data corresponds to a packet of data;

 machine executable code that assigns the first predetermined value as the first sequence number to each of the packets of data;

 machine executable code that, in response to the first sequence number becoming equal to a second predetermined value different from the first predetermined value, acknowledges receipt of the blocks of data corresponding to the packets of data that are assigned the first predetermined value as the sequence number and sending the packets of data that are assigned the first predetermined value as the sequence number to a destination;

 machine executable code that accumulates received packets of data having a sequence number equal to the first predetermined value;

 machine executable code that obtains a first indication that the sequence number equals the first predetermined value;

 machine executable code that obtains a second indication that the sequence number equals a second predetermined value different from the first predetermined value; and

 machine executable code that, in response to obtaining the second indication, transfers data corresponding to packets of data having the sequence number equal to the first predetermined value to a receiving device.

104. A data structure stored in a memory of a computer system, comprising:

a sequence number field that includes a sequence number associated with a block of data corresponding to the data structure, said sequence number being used in sending and receiving said block of data such that when said block of data is one of a plurality of ordered blocks, said plurality is provided to a receiving device in an order in which said ordered blocks were previously provided to a sending device;

an indicator of the number of blocks having said sequence number;

a destination field indicating at least one destination for said data associated with said data structure;

a sent field indicating which of at least one recipients have been sent said data;

a receive field indicating which of said at least one recipients have acknowledged receiving said data; and

a storage field associated with said data.

105. The data structure of Claim 104, further comprising:

a send time stamp field indicating when the data has been sent.

106. The data structure of Claim 105, further comprising:

a receiving time stamp field indicating a predetermined amount of time used as a time-out value such that a receiving storage device may time-out after said predetermined amount of time has passed from when the data was received and when the data is acted upon.

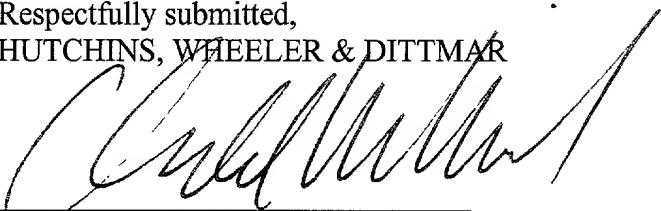
107. The data structure of Claim 106, wherein said a portion of said receive field is available for use by said receiving time stamp field.

108. The data structure of Claim 104, wherein at least one of said sent field, said receive field, and said destination field are a bitmap representation.

REMARKS

Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-951-6676.

Respectfully submitted,
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